MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

TDC1231 – DATA COMMUNICATIONS AND NETWORKING

(All Sections / Groups)

13 October 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 printed pages including cover page with 5 questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answer in the Answer Booklet provided.

Question 1

a) There are four categories of physical topology in data communications.
   i) State ONE (1) advantage and ONE (1) disadvantage of mesh and bus topology respectively. [2 marks]
   ii) Draw a hybrid topology with a star backbone and three ring networks. [2 marks]

b) List TWO (2) responsibilities of Network Layer in TCP/IP protocol suite. [1 mark]

c) Assuming that a cable loses its energy of -0.1 dB in each kilometre it travelled. The total distance between a sender and receiver is 35 km. Calculate the original signal power if the received signal is 90 W. [2 marks]

d) Describe the differences between local area network (LAN) and wide area network (WAN) in terms of size or distance, structure and ownership. [3 marks]

Question 2

a) A cable **X** has a central core conductor of solid wire enclosed in an insulating sheath, which is encased in an outer conductor of metal foil, braid or a combination of the two. It carries high frequency range signals. Identify cable **X**. [1 mark]

b) State TWO (2) characteristics of radio wave. [1 mark]

c) Describe the difference between a low-pass channel and a band-pass channel. [2 marks]

d) A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000 KHz. What is the maximum data rate supported by this line? [2 marks]

e) Distinguish between asynchronous and synchronous transmission in serial transmission. [2 marks]

f) A signal with 200 milliwatts power passes through 10 devices, each with an average noise of 2 microwatts.
   i) What is the SNR? [1 mark]
   ii) What is the SNR_{dB}? [1 mark]

Question 3

a) A non-periodic composite signal contains frequencies from 10 to 30 KHz. The peak amplitude is 10 V for the lowest, the highest signals is 30 V for a 20-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum. [2 marks]

b) Given data stream **00110011**, assuming that the last signal level has been positive. Draw the graph for the following schemes.
i) NRZ – I scheme [1 mark]
ii) Differential Manchester scheme [1 mark]

c) Produce the result of HDB3 scrambling coding scheme for the sequence **11100000000000** using the scrambling techniques. Assume that the last non-zero signal level has been negative. [2 marks]

d) Given the dataword 10100111 and the divisor 10111, show the generation of the codeword at the sender site (using binary division). [4 marks]

Question 4

a) Cyclic redundancy check (CRC) is used in networks such as LANs and WANs to correct errors. A CRC generator is given as x^4+x^2. Explain whether this generator guarantee the detection of a single bit error or not. [2 marks]

b) Explain the goals of multiplexing and list THREE (3) main multiplexing techniques. [2 marks]

c) Distinguish a circuit-switched network from a packet-switched network. [2 marks]

d) A multiplexer combines four 100-kbps channels using a time slot of 2 bits.
i) Show the output with four arbitrary inputs. [2 marks]
ii) Calculate the frame rate. [1 mark]
iii) If each frame carries 8 bits, calculate the bit rate. [1 mark]

Question 5

a) The address 43:7B:6C:DE:10:00 has been shown as the source address in an Ethernet frame. The receiver has discarded the frame. Explain why. [2 marks]

b) i) Estimate the minimum data size in the Standard Ethernet. [1 mark]
ii) If an Ethernet MAC sub layer receives 43 bytes of data from the upper layer, how many bytes of padding must be added to the data? [1 mark]

c) Discuss the advantages of dividing an Ethernet LAN with a bridge. [1 mark]

d) Explain why there is no need for CSMA/CD on full-duplex Ethernet LAN. [1 mark]

e) Explain the basis for membership in a VLAN and explain how a VLAN reduces network traffic. [2 marks]

f) Compare the data rates for Standard Ethernet, Fast Ethernet, Gigabit Ethernet and Ten-Gigabit Ethernet. [2 marks]

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